



A study of heat related illness preparedness in homeless veterans



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ABSTRACT

Heat related illnesses are the leading cause of mortality among weather related natural disasters in the United States. With the growing concern over global climate change and urbanization related regional climate change, outcomes of heat related illnesses can become worse without preparation. People who are homeless have increased vulnerabilities that predispose them to poor outcomes from heat related illnesses. Other than lack of shelter, these vulnerabilities can include poor access to healthcare and vital resources, compromised mental health, as well as lack of knowledge about heat related illnesses. While homeless veterans have access to services through the Department of Veterans Affairs, access can be hindered by unreliable transportation, trust, and the acute need of care.

The study included 644 surveys from the homeless population in the Tampa Bay Area. While veterans were found to have less concern about health during hot weather (52% veterans to 57% non-veterans reporting health concern during hot weather) and better access to water (90.5% veterans to 86% non-veterans reporting access to water), neither difference is statistically significant. When surveyed about warning symptoms of heat related illness, only dizziness was recognized by more than 50% of subjects (56.10%).

To improve outcomes from heat related illnesses, a multi-faceted approach is needed. Cities should create plans for heat waves, provide water/shelters, educate susceptible populations, and optimize medical care. Clean water should be made accessible to all of the homeless population through bottle water or water purification devices. In addition to municipal planning, veteran services organizations should target the needs of veterans by mobile medical care and shelters which can be used during heat events.

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1. Introduction

Homelessness is a condition that leads to poor health outcomes for various reasons, such as exposure to the elements or lack of access to proper medical care [1–3]. Several studies have shown increased mortality among the homeless relative to the general population [2]. Several factors have led to increased mortality including severe poverty, substance abuse, and a higher prevalence of medical problems [4–6]. Increased exposure to violence and trauma has also led to poor outcomes [2, 7]. Heat related illnesses are the leading cause of mortality among weather related natural disasters in the United States and with the growing concern over

global climate change and urbanization, outcomes of heat related illnesses can become worse without preparation [1, 4]. People who are homeless have increased vulnerabilities that predispose them to poor outcomes from heat related illnesses [6–8].

Veterans are more likely to be homeless upon returning from overseas duties due to increased rates of extreme poverty, psychiatric disorders, and social isolation. Extreme poverty is defined by the United Nations as “a condition characterized by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information.” Homeless veterans are more likely to be older and homeless for longer than one year than non-veterans. Veterans are also more likely to abuse alcohol, while other drug use was not significantly higher [15]. However, social and medical needs of veterans were more likely to be addressed than those of non-veterans due to VA services and other organizations targeted at veterans [15]. While these services are offered to veterans, access to them is hindered by lack of transportation- especially in some

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rural areas [13]. Operation Enduring Freedom/Operation Iraqi Freedom/Operation New Dawn (OEF/OIF/OND) are US military operations after 2000, and these veterans only represent less than 3% of all homeless veterans. These veterans are younger, 2/3 report diagnoses of PTSD, about half were diagnosed with a mood disorder, and more than 1/3 have a substance use disorder. All of these issues can lead increase veterans' susceptibility to heat related illnesses.

Although a heat wave is not defined by a standard temperature, it is generally understood as an extended period of uncommonly high atmosphere-related heat stress, which causes temporary modifications in lifestyle habits [14]. A heat wave is defined by the American meteorological society as "A period of abnormally and uncomfortably hot and usually humid weather." Even though heat waves may increase the risk of heat related illness due to a long duration, heat related death could occur during short episodes of high heat. Chronic medical illnesses and substance abuse can make a person more susceptible to heat related illness, and in turn, heat can increase the morbidity and mortality of chronic medical conditions [16,17]. The human body sheds heat through conduction, evaporation, radiation, and convection. The body increases cardiac output and vasodilates near the skin to increase blood flow causing heat elimination via radiation and conduction. Respiration also uses evaporation and water vapor to release heat into the environment. Faster breathing rates help the body to release more heat when febrile. An increase in population mortality has been attributed to physiologic changes of the vascular, respiratory, and nervous systems due to heat [8]. In the US, heat related illnesses have been the most deadly natural disaster annually since 1986 [12]. From 2006 to 2010, the National Center for Health Statistics reported 3332 deaths attributed to natural heat exposure, but also noted that heat related mortality was underreported. Demographics that were found to have higher weather related mortality were lower income, older, male, and African-American. Symptoms of heat exhaustion include nausea, emesis, fatigue, weakness, headache, muscle cramps, and dizziness [9,10]. This progresses to heat stroke causing tachycardia, difficulty breathing, altered mentation, hallucinations, seizures, coma, and death [11].

It is recommended that cities plan for extreme heat events and heat waves and consider taking the following actions: 1) designate a lead agency/organization; 2) utilize a standard warning system activated by predicted weather conditions; 3) educate and communicate with the public; 4) identify high-risk populations and implement response teams to target them; 5) document and evaluate information; 6) manipulate the plan as needed for future events. Municipalities should always plan to have supplies ready in the event of a lengthy heat wave. Supplies include water, tents, sunscreen, shelters with air conditioning, and mobile medical care with intravenous fluids and ice packs.

2. Methods

This survey was designed and further refined by faculty and students. There were 4 pages with 44 questions in the questionnaire. Types of questions included multiple choice, self-ratings, and short response. Demographics of respondents were assessed by the first questions pertaining to gender, date of birth, ethnicity and military history.

The main foci of the questionnaire were hurricane preparation and coping with heat. The survey evaluated whether or not a person had an appropriate support network in case of an evacuation and the respondent's current mental, physical and financial health status. The respondents were also asked if they knew the signs of heat exhaustion and if they had reliable access to drinking water. Most respondents were able to fill out the

questionnaire on their own, although in some cases the research team had to administer the questionnaire face-to-face to respondents who had trouble reading and understanding the survey.

To capture the aspects of each participant's financial, mental, and health background, questions were included as a self-evaluation based on a four point scale of excellent, good, fair or poor. Self-health ratings are effective at evaluating a person's health and can be similar to physician assigned ratings.

The study was conducted at free meal and medical service sites the population served was likely to be homeless. A dozen sites were contacted and asked for permission to conduct the survey. The patients of the Public Defender's Office Mobile Medical Unit were surveyed at care locations in Pasco County FL.

This study received approval from USF's Institutional Review Board (IRB). Verbal and written informed consent was obtained prior to giving each respondent the questionnaire. In addition each respondent was informed that participating in the survey was completely voluntary and that regardless of whether or not they completed the survey they would still receive a \$5 gift card for their time.

3. Results

A total of 656 surveys were administered, 12 of which were not completed so they were excluded. Survey demographics were 76% male and 23% female with 1% unmarked. The racial demographics included 51.4% White, 38.9% Black and 9.7% classified as other. Veterans accounted for 14.2% of the survey data. 53% of the Veterans were from the Post-Vietnam Era with the Vietnam Era being the second highest category at 34%. 45% of Veterans and 36% non-Veterans have been homeless for 1 year or longer.

52% of veterans surveyed were concerned about health during hot weather compared to 57% of non-veterans. 14% of non-veterans do not have access to drinking water while 9.5% of veterans state they do not have consistent access to drinking water. Neither concern nor access to water were statistically significant for veterans compared to non-veterans.

When asked about self-health ratings, the association between Veteran status and physical health was not significant. The association between Veteran status and mental health had a small to moderate significant association with a Phi Value=0.158. Specifically, a greater number of Veterans and a lower number of non-Veterans reported being in excellent mental health than would be expected if there was no association.

Of all survey participants, the known symptoms of heat related illness were reported as sweating by 48.50%, paleness by 25.60%, muscle cramps by 38.50%, tiredness by 34.10%, weakness by 42.70%, dizziness by 56.10%, Headache by 35.40%, nausea/vomiting by 36.50%, and fainting by 36.30% (Fig. 1).

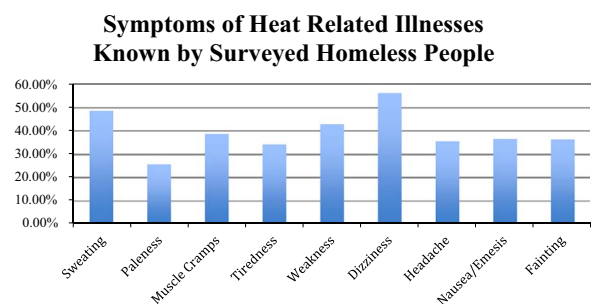


Fig. 1. Percentages of participants who know symptoms of heat related illnesses.

4. Discussion

Homeless veterans do not have significantly better resources than non-veterans, which puts them at risk during heat waves. These veterans have many comorbid conditions, which can make them more susceptible to heat related illness. Some of these comorbid conditions include alcohol abuse, COPD, cardiovascular disease, diabetes mellitus, and psychiatric conditions including PTSD, mood disorders, anxiety disorders, and other psychiatric conditions. From the study, veterans self rated higher than non-veterans for mental health. This could be due to mental health care through the Veterans Affairs (VA) hospitals. Veterans can receive care for service related co-morbidities at VA hospitals and clinics, but sometimes lack of transportation can limit access. Mobile Medical Units can improve medical care and education by going to locations that are more accessible to the homeless populations. Medical care can be implemented to manage their illnesses with medications and referrals to specialists contracted to treat this population. Since knowledge of symptoms is less than 50% for nearly all of the categories, these units should increase education of heat related illnesses and teach veteran and non-veteran homeless individuals how their co-morbidities can make them more susceptible to high temperatures.

The Department of Veterans Affairs provides many services to homeless veterans including healthcare and finding homes and shelters for them to stay, but they can also make an impact by outreach with water and shelter resources. With the advent of newer filters and water purifiers, lacking potable water should not be a contributing factor to the homeless population's risk of heat related illness. Flyers and short sessions with educators can help the populations find shelters with air conditioning or shade in areas with breezes to help the body cool itself.

Further research can be done through medical records to find the incidence of heat related illnesses in the homeless population. Even though heat related illnesses can occur within a range of external temperatures, medical records can be correlated to heat indices to help create accurate warning systems to predict when those outdoors are most susceptible. Medical records can also be combed to find prevalence of co-morbidities in homeless patients. More surveys should be created to discover how often the homeless population feels the symptoms of heat related illness, where they receive medical care, and what obstacles they face to get medical care.

4.1. Conclusions/recommendations

- Veterans do not have significantly better resources for heat related illness preparedness.
- Education about heat related illness preparedness and recognition should be implemented in a way to reach the population.
- Local governments should plan for heat events by designating a

leading entity, creating avenues to disperse resources, analyzing weather data to produce warning systems.

- Medical care should be optimized to ensure co-morbidities are managed with appropriate follow-up.

Disclosures

The University of South Florida funded the study. This included printing of paperwork/surveys and the 656 gift cards for \$5 from Target.

Conflict of interest

No other conflict of interest.

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